# 2007 Early Television Convention

## How RCA's WWII Military Television Development Shaped Modern Warfare

**By:** Maurice Schechter
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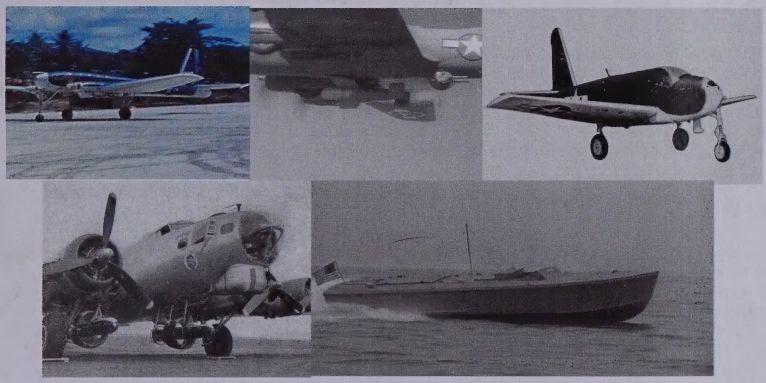
Modern warfare using remote transmission of images as a means of weapons guidance and aerial reconnaissance has its roots before WWII, to an inventor who saw the possibilities of an emerging technology and his boss who supported its successful innovation. The men: Vladimir Zworykin and David Sarnoff of the Radio Corporation of America (RCA). The technology: television.

Maurice Schechter's well illustrated presentation will trace the development of military television from a memo Zworykin wrote in 1934 to the end of the war, where practical TV-guided weapons were used in combat. Military technology that made post war television possible.

Mr. Schechter's presentation will include a demonstration of the very rare restored WWII television equipment used to guide these weapons. The complete system from iconoscope camera to the bombardier's monitor with it's green image will be making pictures over the air as if it was 1944

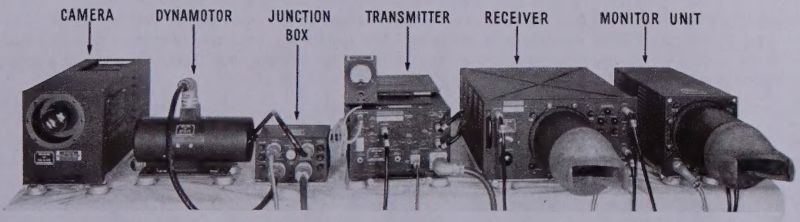
Among his many images, he will be showing archival footage of the developmental TV bombs, filmed recordings / kinescopes from actual bombing runs and an interview with the developer of Army Air Forces GB-4 television guided bomb used in the European theatre.



**Examples of WWII Television Guided Weapons**

**About the Speaker:** Mr. Schechter is chief engineer for DuArt Film and Video in New York City and has spent nearly 20 years researching this subject from the proving grounds of Nevada to the National Archives.

For more information, WWW.EARLYTELEVISION.ORG on events program and other presenters




**WWII Block III Television equipment to be shown operational at the Convention**

# MILITARY TELEVISION EQUIPMENT BUILT BY RCA
# 1942-1945

Project Block

## Block 1

The ATE, ATF, ATG, ATH television camera/transmitters series is known as Block 1. The camera and transmitter are housed in a single case. The sets consisted of four fixed frequencies, 78, 90, 102 and 114 MHz. The channels were 9 mc wide due to the use of double sideband transmission. The RF power is 15 watts. The pickup tube is an iconoscope and the output tube is an 829. The input voltage is 12.5 VDC. The components to the system are the CRV-59AAA to AAD camera transmitter, CRV-21ABY dynamotor, CRV-66ACS to ACV antenna, and CRV-60AAR monitor.
The ARE, ARF, ARG, ARH sets are the matching receiver/displays for the accompanying camera/transmitters. The receivers are fixed frequency, complement to the transmitter, with a self-contained dynamotor and 7" green phosphor CRT. The input voltage is 25 VDC. The components to the set are the CRV-46ABP to ABS receiver, CRV-23ACR voltage control unit, CRV-66ACO to ACR, and ADV to ADY antenna.
The Signal Corps version of the camera/transmitter is SCR-549-T1, T2. The receiver is the SCR-550-T1, T2. The AAF sets are similar to the Navy sets except for slight modifications of design. Contract date 1942.

## Block 3-A

The ATJ set is known as Block 3, the first in a series that was refined during and after the war. The set is an improvement over the Block 1 sets. The camera and transmitter are separate units and improved. The transmitter is tunable to five different frequencies from 264 to 312 MHz, each 9 mc wide. The pickup tube is an iconoscope and the output tubes are 8025's. The RF output power is 15 Watts. Input voltage is 27.5 VDC. The set components are the CRV-59AAE (BC-1211) camera; CRV-52ACA, ABW, ABX, ABY and ABZ (BC-1212) transmitters; (SW-219) remote start switch; CEK-21981 (DM-56) dynamotor; CRV-53AAB (JB-101) junction box; CRV-66AED to AEH (AN-142 to AN-146) antenna; CRV-60ABK (BC-1214) monitor; and CRV-60058 (I-206) test meter. Each of the five transmitters are preset to channels 1 to 5.
The ARJ set is the matching receiver to the ATJ transmitting set. The receiver is tunable to 5 channels in the 300 mc band. The set has a self-contained dynamotor and 7" green phosphor CRT. Input voltage is 28.6 VDC. The components to the set are the CRV-46ACC (BC-1213) receiver, CRV-66ADT (AN-133) antenna, and CRV-60ABK (BC-1214) monitor.
The Signal Corps version of the transmitting set is SCR-549-T3, -A. The receiver is the SCR-550-T3, -A.Contract date 1943.

## Block 3-B

The ATK set is known as Block 3B. The major changes from the ATJ included improved sweep oscillators in the camera and stability improvements to the transmitter. The transmitter is tunable to 10 channels from 264 to 372 MHz. The input voltage is 28.6 VDC. The components to the system are the CRV-59AAE camera; CRV-52ACB transmitter; CEK-21981 or CC-21981 dynamotor; CRV-53AAB junction box; and CRV-66AFX to AGB, AEJ to AEN antenna.
The ARK set is the matching receiver to both the ATJ and ATK transmitting sets. The major changes from the ARK are the improved RF and IF stages. The receiver is tunable to ten 8 megacycle channels, separated by 12 megacycles in the 300 mc band. The set has a self-contained dynamotor and 7" green phosphor CRT. The input voltage is 28.6 VDC. The components to the system are the CRV-46ACD receiver; CRV-66ADT, AFW and ADU antenna; CRV-60ABK monitor; CRV-10175 monitor light shield; and CRV-10173 receiver light shield.
RCA subcontracted part of the production run to Farnsworth Television (CFN), which also produced the ATK and ARK sets. Contract date late 1943.

## Second contract for Block 3-B

Under the new contract, the nomenclature was changed to the AN nomenclature system and further improvements were made.
AN/AXT-2 is the transmitting set. The camera, PH-522/AXT-2, is an improved CRV-59AAE with a solenoid-controlled haze filter. The transmitter is the T-61/AXT-2, which is the same as CRV-52ACB. The junction box, J-60/AXT-2, is the same as CRV-53AAB. The dynamotor is the DY-25/AXT-2. The antennas are the same as the ATK, and the remote switch box is the SA-34/AXT-2.
AN/AXR-1 is the receiving set. The receiver is the R-68/AXR-1, which is the same as the CRV-46ACD except for the addition of 11 enemy destructors . The antennas are the same as the ARK. The monitor is the ID-66/AXR-1, which is the same as CRV-60ABK except for the addition of four enemy destructors.
This set was built by RCA and Farnsworth Radio & Television. Contract date 1944.

## Third contract for Block 3-B

This contract was to take advantage of the new image orthicon technology for the cameras. Two models were built. The first design, the CRV-59AAG, used the first production image orthicon tube, the LM-15 (contract date 1944). The next generation camera, PH-548/AXT-2A, used the improved 2P21 image orthicon. Both of these cameras were interchangeable with ATJ and ATK equipment. The AN/AXT-2A used the same transmitter, dynamotor, junction box and antennas as the AN/AXT-2 with the addition of the PH-548/AXT-2A camera. Contract date 1945

## Modified Block 3-B

After the war, the AXT-2 camera was modified for use in observation and telemetry applications. One such application was on the jet-propelled Bell YP-59B aircraft. Two cameras were connected to a relay unit feeding a single transmitter. The guidance aircraft could remotely switch from a display of the instrument panel to the horizon.
The set is AN/AXT-3. Equipment is the PH-565/AXT-3 camera with flood light package, PH-569/AXT-3 camera, T-61A/AXT-2 transmitter, AT-126/AP stub antenna, AS-425/U & AS-426/U yagi antenna, and RE-26/AXT-3 relay unit. The rest of the components are the AXT-2.
Contract date 1945 to about 1954.

Project Mimo

MIMO is an acronym for Miniature Image Orthicon. During the war, advances in tube miniaturization made project MIMO possible. The project entailed the use of a medium-angle guided bomb-type missile called ROC, with television guidance. The system was to consist of a small cylindrical camera unit placed in the nose of the missile, a small transmitter, power supply and a dipole antenna. The complete system weighed 50 pounds, and had a power of eight watts in the 264 to 372 mc range. The designation is the AN/AXT-7. Contract date early 1945.

Project Ring

This equipment was developed for long-range, high-altitude reconnaissance operation. This equipment was designed for attended operation, with weight and complexity considerations secondary to the production of high definition television pictures. The project was a joint development between NBC and RCA. Two cameras were developed using image orthicons, PH-536/AXS-1 and PH-537/AXS-1, the AN/AXT-5 transmitter, R-90/UXR-2 receiver, and ID-86/UXR-2 monitor. The transmitter operated on 90 to 102 mc with a peak power of 1400 watts. Range was 200 miles at 22,500 ft. The transmitting set is the AN/AXS-1 and the receiving set is the AN/UXR-2. Contract date 1944.